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primary importance of anatomical characters as the basis of true relationship, and this book will do much toward dissipating the older and altogether fallacious idea that a classification of fossil plants based upon external characters alone is possessed of permanent value. While the external forms of plants or their parts may possess a certain value for taxonomic purposes, such characters are in all probability least reliable in the case of fossils where they depend so largely upon the modifying influence of conditions under which the plant has been preserved. They are therefore oftentimes most misleading, and although we may admit their general value as a provisional means of classifying remains which cannot be otherwise distinguished, they possess no scientific merit and should be abandoned as fast as more accurate data become available.

That this book will do much to stimulate a more active interest in this important line of research we cannot doubt, but its mission will be well accomplished if it does no more than to finally convince botanists of their real dependence upon data derived from a study of the extinct forms of plant life.

D. P. PENHALLOW.

MCGILL UNIVERSITY,
Feb. 6, 1901.

A Contribution to the Study of the Insect Fauna of Human Excrement. By L. O. HOWARD. Proc. Washington Academy of Sciences, Vol. II., pp. 541-604. 2 pls.

A brief summary of the results obtained by Dr. Howard in his study of the insects affecting human excrement was given in the *Popular Science Monthly*, January, 1901. We have now before us the detailed work, in which the insects concerned are fully discussed and in many cases figured.

No resident of this country is likely to forget the deplorable outbreaks of typhoid fever which occurred in the military camps at the time of the war with Spain. It appears that every regiment in the United States service in 1898 developed typhoid, while more than 80 per cent. of the deaths in camp were due to this disease. This condition of affairs naturally aroused a great deal of popular anxiety and indignation, while medical men bestirred them-

selves to discover the exact causes of the spread of the fever. As a result, it came to be generally believed that flies had a great deal to do with the spread of typhoid bacilli, and one of the most prominent medical investigators concluded that 'flies undoubtedly served as carriers of the infection.'

Admitting, then, the agency of flies in the spread of typhoid fever and other ills, the question naturally arose, 'What flies?' This question the medical men did not pretend to answer, and the way was clearly open for an entomologist to supply the desired information. Dr. Howard, who loses no opportunity to make the Division of Entomology serviceable to the public, at once began an investigation which has now resulted in the publication of exact and minute details to take the place of supposition and vague surmise. Not only were the insects frequenting human excrement carefully watched and recorded, but feces were collected in great numbers, and the species breeding in them ascertained. As had been anticipated, flies were found in plenty; in fact, no less than 77 different species were obtained, of which 36 were actually found breeding in the feces. In addition to this, 23,087 flies were caught in kitchens and pantries in different parts of the country, in order to see how many of the kinds visiting or breeding in human excrement also visited places where food was kept, and were likely to crawl over the food. It appears that the flies most commonly found breeding in human excrement are not those which frequently enter dwellings, but there are several species which are likely to pass directly from the excrement to places where food is kept, and so become a dangerous source of infection. This is true of the common house fly (*Musca domestica*), the vinegar fly (*Drosophila ampelophila*), the stable fly (*Muscina stabulans*) and a number of others.

The practical conclusions reached by Dr. Howard should become known to all municipal authorities. It is shown that human excrement is much more dangerous to the public health than dead animals or other refuse. Every care should be taken to provide for its removal from those places where flies can gain access to it, and those depositing it in by-ways and vacant

lots should be severely punished. It seems to the present writer that the excrement nuisance, which now appears in a new and more serious light, cannot be got rid of until city authorities see their way to provide places of public convenience in every ward, so that no one need resort to either the alleys or the saloons to obey the dictates of nature. Dr. Howard has, indeed, provided the municipal reformer with a new and valuable argument, which it is to be hoped he will not fail to use.

From the standpoint of scientific entomology Dr. Howard's paper is of much interest. It records for the first time the breeding habits of a large number of insects, and also adds greatly to our knowledge of their distribution. Three species of flies proved to be new to science; these have been described by Mr. Coquillett in *Entomological News*, January, 1901.

In all the work Dr. Howard was ably assisted by several members of his office force, particularly Messrs. Pratt and Coquillett. To these careful credit is given, in accordance with Dr. Howard's invariable custom. The figures are numerous and clear, 25 species being illustrated, often with the early stages. By some slip, *Drosophila ampelophaga* is called 'ampelophaga' on the plate, but the name is given correctly in the text. *Limosina albipennis* and *L. crassimana*, to judge from the figures, should belong to different genera.

T. D. A. COCKERELL.

BOOKS RECEIVED.

- Les phénomènes électriques et leurs applications.* HENRY VIVAREZ. Paris, Georges Carré et C. Naud. 1901. Pp. vi + 574.
A Laboratory Guide in Elementary Bacteriology. WILLIAM DODGE FROST. Madison, Wis., published by the Author. 1901. Pp. viii + 205.
Ausgewählte Methoden der analytischen Chemie. A. CLASSEN. Braunschweig, Friedrich Vieweg und Sohn. 1901. Vol. I. Pp. xx + 940.
Essays in illustration of Astral Gravitation in Natural Phenomena. WILLIAM LEIGHTON JORDAN. New York and Bombay, Longmans, Green & Company. 1900. Pp. xiv + 192.
General Report of the Investigations in Porto Rico of the United States Fish Commission Steamer Fish Hawk in 1899. BARTON WARREN EVERMANN. Washington Government Printing Office. 1900. Pp. vi + 350, and 50 Plates.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Physical Chemistry. December. 'Reaction Velocity and Equilibrium,' by Wilder D. Bancroft; 'Differences of Potential between Metals and Non-aqueous Solutions of their Salts,' II, by Louis Kahlenberg. A formula has been deduced by Nernst for the E. M. F. of a galvanic chain of the type

$\text{Ag} | \text{AgNO}_3 \text{ (concentrated)} | \text{AgNO}_3 \text{ (dilute)} | \text{Ag}$

which shows a fair degree of agreement with the observed values when water is used as a solvent. The author has tested the formula experimentally in a number of cases in which non-aqueous solutions are used, and finds that Nernst's formula does not hold good under these circumstances; 'Solvent Action of Vapors,' by A. T. Lincoln. A study of the solvent action of the vapor of water, benzene and acetone upon salicylic and benzoic acids, and of alcohol vapor upon camphor and naphthalene.

January. 'Gas Polarization in Lead Accumulators,' by C. J. Reed; 'Two Devices for Circulating Liquids at a Constant Temperature,' by Ira H. Derby; 'On the Equilibrium of Chemical Systems,' by Paul Saurel. The translation of the more important parts of a thesis of the same title, presented to the Faculté des Sciences of Bordeaux.

THE first (January) number of Volume II. of the *Transactions of the American Mathematical Society* contains the following papers: 'Invariants of Systems of Linear Differential Equations,' by E. J. Wilczynski; 'Divergent and Conditionally Convergent Series whose Product is Absolutely Convergent,' by Florian Cajori; 'Sets of Coincidence Points on the Non-Singular Cubics of a Syzygetic Sheaf,' by M. B. Porter; 'Note on Non-Quaternion Number Systems,' by W. M. Strong; 'On the Reduction of the General Abelian Integral,' by J. C. Fields; 'Ueber Flächen von Constanter Gauss'scher Krümmung,' by David Hilbert; 'Note on the Functions of the Form $f(x) \equiv \phi(x) + a_1x^{n-1} + a_2x^{n-2} + \dots + a_n$ which in a given Interval differ the least possible from Zero,' by H. F. Blichfeldt.

THE February number of the *Bulletin* of the American Mathematical Society contains the fol-